Claims

1. A synthetic magnesium silicate composition of the formula:

$$\{[Si_8(Mg_aLi_b)O_{20}(OH)_{4-c}F_c]^{d-}\frac{d}{n}M^{n+}\}_w\{Na_2SO_4\}_x\{Na_2CO_3\}_y\{H_2O\}_z$$

wherein a is 4.5 to <6.0, b is from >0 to 1.5, c is from 0 to 4, d = 12-2a-b, M is a cation, n is the valency of the cation M, w is from 32.8 to 94.7 % w/w, x is from 0.3 to 32.0 % w/w, y is from 0 to 9.0 % w/w, and z is from 0 to 50 % w/w.

2 A process for the preparation of a synthetic magnesium silicate composition of the formula:

$$\{[Si_8(Mg_aLi_b)O_{20}(OH)_{4-c}F_c]^{d-}\frac{d}{n}M^{n+}\}_w\{Na_2SO_4\}_x\{Na_2CO_3\}_y\{H_2O\}_z$$

wherein a is 4.5 to <6.0, b is from >0 to 1.5, c is from 0 to 4, d = 12-2a-b, M is Na or Li, n is 1, w is from 32.8 to 94.7 % w/w, x is from 0.3 to 32.0 % w/w, y is from 0 to 9.0 % w/w, and z is from 0 to 50 % w/w, the process consists essentially of the following sequential steps:

(i) forming an aqueous suspension of magnesium carbonate,

(ii) forming a silica precipitate in the aqueous suspension of magnesium carbonate, the proportions of magnesium provided by the magnesium carbonate and of silica precipitated in the suspension corresponding to that of the formula of the magnesium silicate,

(iii) whilst maintaining the resulting mixture of magnesium carbonate and silica in the wet state, subjecting it to hydrothermal treatment by heating it in an aqueous medium and in the presence of the remaining constituents of the magnesium silicate in proportions within the ranges specified in the general formula thereof and in the presence of excess dissolved sodium or lithium compound over that required to form the cation thereof until crystal growth occurs,

(iv) separating the solid and liquid phases, and

(v) drying the resultant solid product at a temperature up to 450°C.

3. A process for the preparation of a synthetic magnesium silicate composition of the formula:

$$\{[Si_8(Mg_aLi_b)O_{20}(OH)_{4-c}F_c]^{d-}\frac{d}{n}M^{n+}\}_w\{Na_2SO_4\}_x\{Na_2CO_3\}_y\{H_2O\}_z$$

wherein a is 4.5 to <6.0, b is from >0 to 1.5, c is from 0 to 4, d = 12-2a-b, M is Na or Li, n is 1, w is from 32.8 to 94.7 % w/w, x is from 0.3 to 32.0 % w/w, y is from 0 to 9.0 % w/w, and z is from 0 to 50 % w/w, the process consists essentially of the following sequential steps:

(i) forming an aqueous slurry from

(a) a water-soluble magnesium salt,

(b) sodium silicate,

(c) sodium carbonate or sodium hydroxide and

(d) material delivering lithium and fluoride ions selected from the group consisting of (A) lithium fluoride and (B) a lithium compound in conjunction with hydrofluoric acid, fluosilicic acid, sodium silicofluoride or sodium fluoride, such that in the slurry the following atomic ratios are present

$\frac{Si}{F}$ = 0.5 to 5.1 $\frac{Li}{Mg}$ = 0.1 to 1.0

$\frac{Si}{Mg + Li}$ = 0.5 to 1.5 $\frac{Na}{2\,Mg + F - Li}$ = 1.0 to 2.0

the aqueous slurry being formed by co-precipitation by slowly combining the said magnesium salt and the said sodium silicate and the said sodium carbonate or sodium hydroxide, with heating and agitation, in an aqueous medium which contains the said material or materials delivering the lithium and fluoride ions;

(ii) taking the aqueous slurry so formed and, without washing free from soluble salts, hydrothermally treating it for about 10 to 20 hours until crystal growth occurs,

(iii) separating the solid and liquid phases, and

(iv) drying the resultant solid product at a temperature up to 450°C.

4. A process for the preparation of a synthetic magnesium silicate composition of the formula:

$$\{[Si_8(Mg_aLi_b)O_{20}(OH)_{4-c}F_c]^{d-}\frac{d}{n}M^{n+}\}_w\{Na_2SO_4\}_x\{Na_2CO_3\}_y\{H_2O\}_z$$

wherein a is 4.5 to <6.0, b is from >0 to 1.5, c is from 0 to 4, d = 12-2a-b, M is Na or Li, n is 1, w is from 32.8 to 94.7 % w/w, x is from 0.3 to 32.0 % w/w, y is from 0 to 9.0 % w/w, and z is from 0 to 50 % w/w, the process consists essentially of the following sequential steps:

(i) precipitating a magnesium silicate having the value of "a" desired in the said composition by combining an aqueous solution of a water soluble magnesium salt with an aqueous alkaline solution of one or more sodium compounds in the presence of dissolved silicon-delivering material, the pH of the alkaline solution being maintained at 8 to 12.5 throughout,

(ii) without first drying or washing this precipitate heating it to a temperature of at least 170 °C. and the pressure of at least 6.9 bar (100 psi), the temperature being less than 370 °C. and such that a liquid phrases present, until crystal growth occurs,

(iii) separating the resultant solid and liquid phrases, and

(iv) drying the resultant solid product.

5. A composition as claimed in claim 1 or process as claimed in any one of claims 2 to 4, wherein a is from 5.30 to 5.68, preferably from 5.42 to 5.55.

6. A composition as claimed in claim 1 or claim 5, or process as claimed in any one of claims 2 to 4 or claim 5, wherein z is less than 2.

7. A composition as claimed in any one of claims 1 or 5 to 7 or a process as claimed in any one of claims 2 to 4 , 5 or 6, wherein M is selected from Na, K, Li, an organic cation, and mixtures thereof, preferably M is selected from Na, Li and mixtures thereof.